APPENDIX C. WASTE LOAD ALLOCATION METHODS CONSIDERED

In developing the proposed TMDL, several alternative waste load allocation methods were considered for allocating portions of the loading capacity to chlorine bleaching pulp mills. These alternatives were presented in the Decision Document for the proposed TMDL to illustrate the effect of assumptions made on resulting WLAs and to stimulate public consideration of the pros and cons of alternative allocation scenarios. Included in the presentation of options was one preferred alternative.

There was no information received during the public comment period which has caused EPA to change its decision about the preferred allocation method (Option 4, Table C-2). Two additional options were suggested, however. These were: (1) allocate the entire loading capacity to the bleaching pulp mills, and (2) require zero discharge of dioxin from the pulp mills. The first suggestion is clearly inappropriate since other sources, which are presently difficult to control, would cause the loading capacity of the system to be exceeded. Appendix B includes additional discussion and estimates of sources other than chlorine bleaching pulp mills which supports the likelihood of this exceedence. The zero discharge option is also further discussed in this document and in the response to comments. Zero discharge is not necessary in order to meet water quality standards for dioxin in the Columbia River basin.

For the convenience of the public, the discussion of options contained in the Decision Document for the proposed TMDL is repeated here. The alternative approaches considered fall into several different categories which include:

- Equal Effluent Concentrations
- Equal Mass Discharge per Unit Production
- Equal Percent Reduction

Equal Effluent Concentrations:

One allocation option is to set an equal effluent concentration for each pulp mill which uses chlorine bleaching. The resultant cumulative load is the portion of the loading capacity allocated to chlorine bleaching pulp mills located in EPA Region 10. Some margin of safety is then provided by the difference between the loading capacity and the WLAs to the chlorine bleaching pulp mills in the Columbia basin of Region 10. The unallocated amount depends directly on the effluent concentration selected.

A starting point is to look at a long term average effluent limit of 10 ppq (the current general method detection limit) at each mill. This limit is initially applied at the

point of discharge. Total plant effluent flows are used as a basis to calculate loads. Discharge monitoring report (DMR) data have been summarized and includes average effluent discharge rates.

Using a long term average effluent limit of 10 ppq applied at the point of discharge and current estimates of monthly average flow at each mill, the cumulative load from all the mills equals 11.7 mg/day (Table B-1). This is greater than the loading capacity of 5.97 mg/day. Consequently, this option must be rejected because water quality standards would not be met under conservative assumptions, such as no attenuation. In addition, this would not account for any 2,3,7,8-TCDD from other sources. Thus, more restrictive controls are needed.

A permit condition set at a level below the general analytical detection limit creates a situation where it is difficult, if not impossible, to determine compliance. Because dioxins and other chlorinated organic compounds are produced in the bleach plant, concentrations of 2,3,7,8-TCDD are higher in the combined bleach plant flow than in the total plant effluent. This means that waste load allocations which result in total plant effluent concentration limits that are below the general analytical detection limit could be monitored for compliance by measuring concentrations in the combined bleach plant waste stream. Using **estimates** of bleach plant flows and a long term average limit of 10 ppq in the combined bleach plant flow, the cumulative load is 3.7 mg/day or approximately 62 percent of the total loading capacity (Table B-1). Although this option yields a cumulative load from chlorine bleaching pulp mills which is less than the loading capacity, several concerns exist:

- there is very little room for allocations to other potential sources, such as woodtreaters or the mill in British Columbia (estimates described in Appendix B indicate current loadings from other sources would exceed the unallocated portion of the loading capacity)
- there would be no margin of safety
- future growth in the pulp & paper industry is not addressed

For these reasons, the possibility of yet lower effluent limits was evaluated. This was accomplished by setting a "maximum" concentration of 10 ppq, rather than using a long term average of 10 ppq. To understand how this results in a lower allocation, the relationship between the waste load allocation (WLA) and the actual permit limits must be examined. In certain cases, permit limits will be different than WLA values. Because the criteria for 2,3,7,8-TCDD is set to protect human health, the loading capacity (and WLAs) reflect a long term average. It is important to consider how the WLAs address variability in effluent quality. Permit limits are set at the upper bounds of acceptable performance and are values not to be exceeded. Requirements are usually expressed using two types of permit limits, either daily maximum or monthly average. Procedures have been developed for computing monthly average permit limits from long term average WLAs in EPA's TSD ("Technical Support Document for Water Quality-based Toxics Control", U.S. Environmental Protection Agency, 1985).

Assuming a coefficient of variation (C.V.) of 0.6 describes the effluent variability for 2,3,7,8-TCDD from pulp mills[1] and one sample required to be taken per month, a monthly average permit limit of 10 ppq converts to a long term average WLA value of 4.7 ppq. Using estimates of bleach plant flows and 4.7 ppq as the long term average concentration limit for the combined bleach plant flow, the cumulative load is 1.8 mg/day or just over 30 percent of the total loading capacity. This leaves nearly 70 percent of the loading capacity available to cover loadings from other potential sources. This approach also results in more than a 95 percent reduction in 2,3,7,8-TCDD discharged from these pulp mills when compared to estimates of current loading based on results of the 104 mill study.

Table C-1. Waste Load Allocations for Chlorine-Bleaching Pulp Mills

Production (tons/day)	Percent	Option 1 TCDD WLA (mg/day)	Option 2 TCDD WLA (mg/day)	Option 3 TCDD WLA (mg/day)	Mill
1,509	17.2	1.42	0.71	0.33	Potlatch -- Lewiston, ID
957	10.9	0.76	0.14	0.06	Boise Cascade -- Wallula, WA
1,650	18.8	2.20	0.87	0.41	James River -- Camas, WA
310	3.5	2.37	0.23	0.11	Longview Fibre -- Longview, WA
1026	11.7	2.01	0.57	0.27	Weyerhaeuser -- Longview, WA
1500	17.1	0.19	0.19	0.19	Pope & Talbot -- Halsey, OR [2]
1,035	11.8	1.29	0.64	0.30	Boise Cascade -- St. Helens, OR
800	9.1	1.44	0.36	0.17	James River -- Wauna, OR
7,837	100.0	11.67	3.72	1.84	TOTAL Source Category Allotment

Option 1: Set Equal Long Term Average Effluent Concentration of 10 ppq at Point of Discharge

Option 2: Set Equal Long Term Average Effluent Concentration of 10 ppq at Bleach Plant

Option 3: Set Equal Long Term Average Effluent Concentration of 4.7 ppq at Bleach Plant

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[1] A C.V. of 0.6 is recommended in EPA's TSD ("Technical Support Document for Water Quality-based Toxics Control", U.S. Environmental Protection Agency, 1985) for situations where there is insufficient data to estimate a C.V. for a specific pollutant from a specific industrial process. In the fact sheet accompanying the public notice for the draft TMDL, EPA solicited information of use in developing a more appropriate C.V., if available, from the public. No such information was provided.

[2] The WLAs listed for Pope & Talbot under all options have been adjusted to the long term average of 0.19 mg/day identified in the NPDES permit issued by the Oregon Department of Environmental Quality (November 7, 1990).

Equal Mass Discharge per Unit Production:

A disadvantage of equal effluent concentrations based on current flow rates is that it may not be equitable for all mills. A common approach for industrial permits is to consider production levels in establishing effluent limits. To provide for more equity, each mill could be allocated an equal amount of 2,3,7,8-TCDD for discharge per quantity of bleached pulp produced. One way to accomplish this is to associate bleach plant flow rates with production quantity of bleach pulp. In estimating bleach plant flows, the Washington Department of Ecology used 14,470 gallons of wastewater generated per ton of bleached pulp produced. Applying this figure to calculate bleach plant flows and 4.7 ppq as the long term average concentration limit for the combined bleach plant flow, the cumulative load is 2.07 mg/day (Table B-2) or approximately 35% of the total loading capacity.

Table C-2. Waste Load Allocations for Chorine-Bleaching Pulp Mills

(**Option 4:** Set Equal Long Term Average Effluent Concentration of 4.7 ppq at Bleach Plant and Set Flows at 14,470 gallons / ton bleached pulp)

Production (tons/day)	Percent	TCDD WLA (mg/day)	Mill
1,509	17.2	0.39	Potlatch -- Lewiston, ID
957	10.9	0.25	Boise Cascade -- Wallula, WA
1,650	18.8	0.42	James River -- Camas, WA
310	3.5	0.08	Longview Fibre -- Longview, WA
1026	11.7	0.26	Weyerhaeuser -- Longview, WA
1500	17.1	0.19	Pope & Talbot -- Halsey, OR [1]
1,035	11.8	0.27	Boise Cascade -- St. Helens, OR
800	9.1	0.21	James River -- Wauna, OR
7,837	100.0	2.07	TOTAL Source Category Allotment

Although this is an increase of 0.13 mg/day over that shown in Table 5-5, the approach does address one major problem with using current bleach plant flows. Mills have been encouraged to recycle internal waste streams to the maximum extent possible. One example, Boise Cascade at Wallula, practices extensive recycling. Under the equal effluent concentration method, a mill that does a high level of recycling receives a lower allocation. However, a mill that does not make efficient use of water in the bleach plant benefits from a high allocation. This is a major reason for relating bleach plant flows to pulp production when determining allowable loads. This

[1] The WLA listed for Pope & Talbot has been adjusted to the long term average of 0.19 mg/day identified in the NPDES permit issued by the Oregon Department of Environmental Quality (November 7, 1990).

approach still results in more than a 95 percent reduction in 2,3,7,8-TCDD discharged from these mills when compared to results of the 104 mill study. Based on the evaluation in Appendix B, this reduction, although less than obtained by Option 3, is still sufficient to achieve total 2,3,7,8-TCDD loadings to the basin which are less than the loading capacity.

Equal Percent Reduction:

Another option considered is **equal percent reduction for all source categories**. Because there is an absence of specific data for loadings of TCDD to the Columbia, this approach can be viewed in several different ways. The first could use information on the relative magnitude of 2,3,7,8-TCDD in fish collected below potential sources of dioxin. Using median tissue concentrations summarized in Table A-1 as a general indicator of these relative contributions, thirty-six percent (36%) of the loading capacity could be attributed to chlorine bleaching pulp production. The remaining sixty-four percent (64%) could be attributed to other sources, such as municipal wastewater treatment plants or agricultural areas. This analysis excludes refineries because this industry is not known to be a significant source in the Columbia drainage. Although this approach does offer some advantages by accounting for other source categories, there are some major drawbacks. These include:

- NBS was intended as a screening study and not to describe source category loadings
- fish sampled nationally were collected from streams of varying sizes and did not account for dilution
- results of NBS associated with certain source categories may also include other sources (i.e. a site directly below a municipal wastewater treatment plant may also be 30 miles below a bleached kraft pulp mill)

Another option suggested is to use values of 2,3,7,8-TCDD measured in Columbia River fish and the bioconcentration factor used to develop the water quality criterion (0.013 ppq) to "back calculate" current TCDD loads. Although it may be possible to estimate the relative magnitude of present plus historic TCDD loading by looking at tissue concentrations, other factors besides a weighted average bioconcentration factor of 5000 must be considered. For instance, bioconcentration factors specific to the species should be evaluated. The age of the fish and lipid content of the samples must also be taken into account. The 5000 bioconcentration factor used to develop the criterion is intended to represent the weighted average factor for the species mix and lipid content in the "average" American fish / shellfish diet. The lack of species-specific bioconcentration data, as well as the difficulty in distinguishing the effects of historic versus current loading, makes using this approach inappropriate for this TMDL at the present time.